



January 6, 2022

Greg Fedner
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1250 Fairwood Avenue
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**RE: *Carvana – 8350 Lyra Drive
Type II Variance***

The purpose of this letter is to provide satisfactory information for the variance requested. Through storm CC19432 plan review process, the reviewer noted that 0% voids must be used for the underground Contech detention system. Contech met with Doug Holz to discuss this and other comments and it was noted that a variance must be submitted to count the voids in the stone as detention volume. Section 3.4.3.3.a.ii notes that stone backfill may not be included when calculating total system volume. The variance being requested is to allow the stone backfill to be counted with 30% voids as allowed in open bottom systems in section 3.4.3.3.b.iii.

A perforated pipe system acts in the same way as an open bottom system with stone backfill as both promote infiltration. Not allowing the voids to count in the perforated pipe system results in a larger system that would not actually be required since water will infiltrate throughout the perforated system. The larger system adds +/- \$88,000 in extra costs to the project. My client is set to close on the property on 1/24/2022.

Site Development Alternative 1

- Provide ADS underground system instead of Contech
 - Based on depth of storm sewer outlet and elevations, the system heights that ADS can provide requires a much larger rectangular footprint to meet the City's water quantity and quality requirements. The client has expressed desire to have smallest footprint of underground detention as possible. The ADS system is allowed to count voids since it has an open bottom. It is our understanding this system would cost more than the Contech system as its height to shape ratio is not as efficient as the circular system used with Contech.

Site Development Alternative 2

- Provide larger Contech system that doesn't count the voids
 - Larger footprint requires approximately \$88,000 more in costs. This provides an excess amount of water quality and quantity volume since the stone would still be installed and the voids would still be utilized, just

not allowed to be counted in the calculations

Site Development Alternative 3 (Preferred Solution)

- Keep current footprint and allow 30% voids in the stone to be counted towards volume
 - Water quality and quantity requirements can still be met per Columbus code requirements. The system acts like an open bottom system since it is perforated pipe and voids are allowed on those systems.

Based on the above notes, we believe a perforated system functions in similar fashion as the open bottom systems in which stone voids are allowed to be counted (Site Alternative 3). Attached appendix has additional information supporting the use of 30% stone volume. Should you have any questions or further concerns, please do not hesitate to contact me.

Regards,



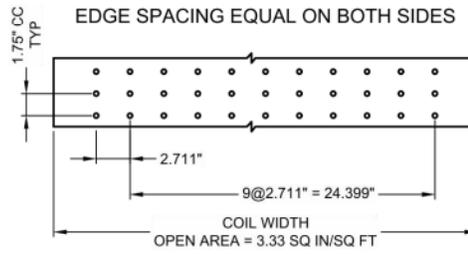
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Appendix – Contech 30% Stone Volume Support

Appendix: Supporting information for use of 30% stone volume in total system volume

The information appended herein is intended to provide support for the use of at least 30% stone storage volume for perforated closed conduit systems. Compared to open bottom chamber-type systems that allow 30% stone storage volume, perforated closed conduit systems (perforated pipe) provide the same functionality in allowing water to pass from the storage system to the surrounding stone. Arguments against using stone storage for perforated pipe are often cited as an assumption that the perforations in the closed conduit would clog and render the stone storage inaccessible for water storage. We have found no proof of that assumption, and the supporting arguments below should provide the City with enough assurance that perforations in closed conduit systems are not prone to clogging, and therefore should be allowed to include stone storage in the total system volume calculation.

1. **Pretreatment:** Per OEPA CGP requirements, underground detention systems must include a minimum of 50% TSS pretreatment. This includes solid wall and perforated closed conduit systems. This pretreatment provides bulk sediment and trash capture before pollutant-laden stormwater can enter the detention system. By providing this pretreatment, the sediment present in the underground detention system is minimized and would not pose a risk of perforation occlusion. In comparison, open bottom chamber systems are allowed 30% stone volume by the City, because the underground geotextile filter system practice is credited with an equivalent 50% pretreatment upstream of the open bottom detention system.
2. **Perforation size:** Perforations are typically 3/8" in diameter (subject to manufacturing tolerance). Depending on the corrugation size, this provides an open area of approximately 3.33 sq. in./ sq. ft. of pipe wall. The flow path of water into the surrounding stone is not restricted to only the invert as it would be for open bottom systems; instead, the perforations run the full circumference of the pipe. This means that if sediment were to build up in the invert, the water will still be able to enter the stone through the sides and even top of the pipe. (See Figure 1)
3. **Maintainability:** In the event of sediment entering the perforated closed conduit, maintenance access is provided to facilitate removal of built-up sediment. Depending on the diameter of the pipe, the maintenance access often allows for confined space entry to thoroughly inspect and clean the interior. Compared to open bottom systems where the only way to remove trapped sediment is to reverse-jet the accumulation without confined space entry, maintenance of pipe systems is more accessible and feasible. An example of accumulation in a perforated pipe invert is provided in Figure 2, which was taken during a routine inspection and maintenance event.



NOTES:

1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. DIMENSIONS SUBJECT TO MANUFACTURER'S TOLERANCES.
4. ALL HOLES 3/8"Ø.

EXFILTRATION AREA
STANDARD PERFORATION PATTERNS

APPROXIMATE AREA PER LINEAR FOOT OF PIPE				
PIPE	CORRUGATION PATTERN			
	2 2/3" x 1/2"	3" x 1"	5" x 1"	ULTRA FLO
60"Ø	61.1 SQ. IN.	64.5 SQ. IN.	62.8 SQ. IN.	

NOTES:

- GAGE AND COATING LIMITATIONS APPLY. 5" x 1" IS NOT AVAILABLE IN ALUMINUM.
- DIMENSIONS SUBJECT TO MANUFACTURER'S TOLERANCES.

TYPICAL PERFORATION DETAIL
NOT TO SCALE

Figure 1 - Perforation Size Detail



Figure 2 - Accumulated Sediment in Invert